



FLIGHT SIMULATION FOR THE 1990s ...
AND BEYOND

In the evolution of the modern flight simulator there have been relatively few revolutions.

The introduction of the digital computer was one; the advent of computer generated imagery perhaps another.

Now there is Concept 90.

A DESIGN REVOLUTION FOR THE 1990s

Concept 90 is a design revolution from which the conventional flight simulator of the 1980s has emerged

transformed to meet the training challenges of the 1990s.

It incorporates entirely new standards of functional, ergonomic and aesthetic design that will dramatically improve the instructor's operating environment and overall training efficiency.

It will address long term life cycle costs through innovation in both equipment packaging and maintenance access.

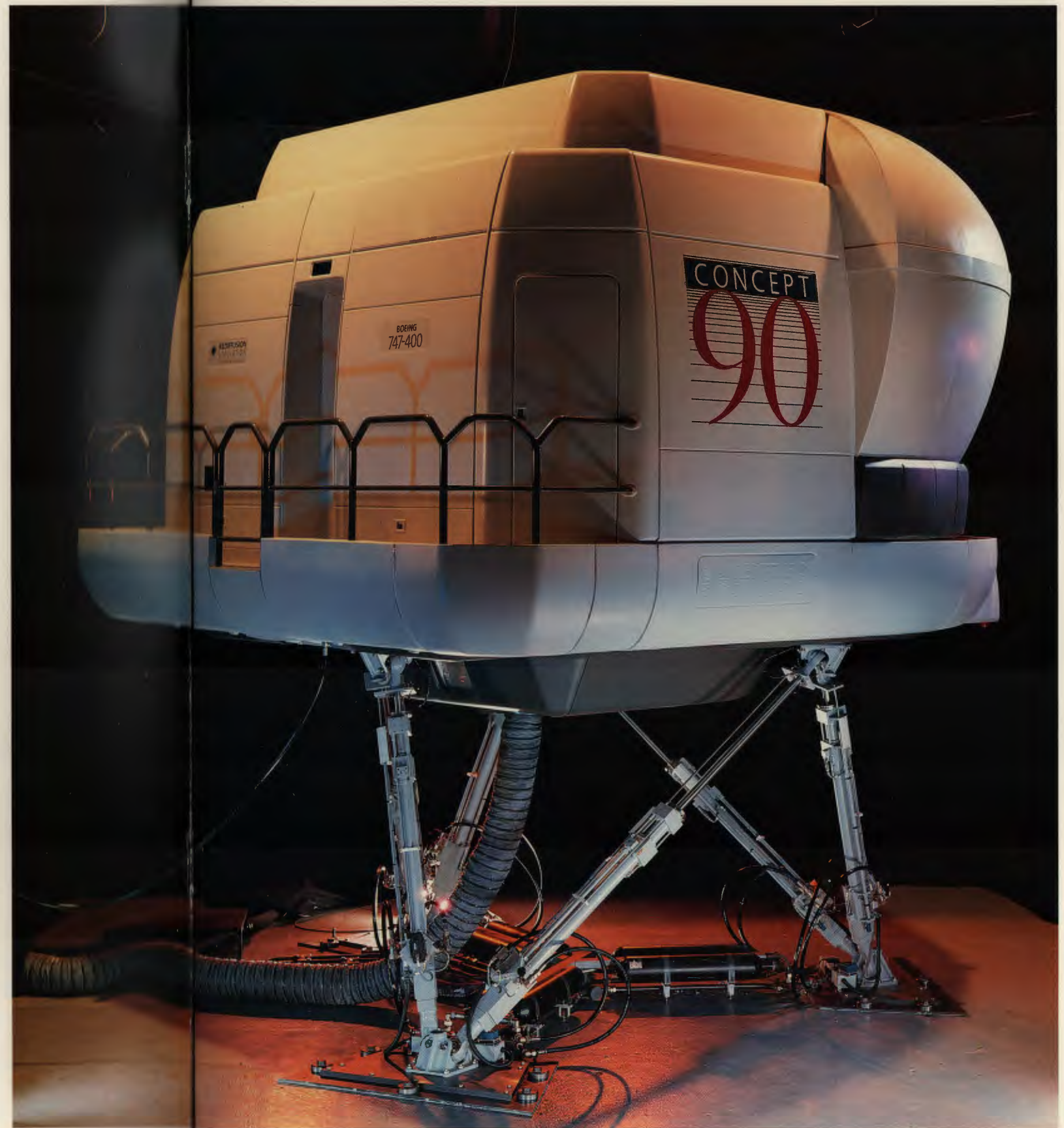
It takes account of advanced materials and modular manufacturing techniques, in both hardware and software, to improve product quality and progressively reduce delivery timescales.

And, because Concept 90 is configured around proven, state-of-the-art technology, it meets and exceeds the world's most demanding regulatory training requirements. It is also ultimately reliable.

But all that is just the beginning.

Concept 90 has been designed from the outset as a long term evolutionary platform which, with the technologies of tomorrow in mind, will take flight simulation well into the 21st century.

Yet it is here today. Concept 90 will rapidly become our production standard for major civil and relevant military aircraft and, as it does, flight simulators will never be the same again.



AN EXERCISE IN DESIGN INTEGRATION

Up to now it has been generally assumed that design integration, as it applies to the modern flight simulator, is of little consequence.

Certainly it has not been a major issue during the technology led drive towards the achievement, and consolidation, of zero flight time training during the early and mid 1980s.

That, however, is not the case today.

Design has, in fact, emerged as a major issue among simulator operators who face a totally new set of challenges for the 1990s and for whom zero flight time technology is now simply an expectation.

In particular, these operators have become increasingly concerned about delivery timescales, life cycle operating costs, product quality, equipment packaging and accessibility and the ergonomics of the instructional environment, as well as overall aesthetic appearance.

In a recent market research study, consensus opinion was that current standards of design integration were unacceptable and that simulator manufacturers had done little to improve this aspect of their products in line with technology advancement.

Concept 90 then has been developed, literally from the ground up, to address precisely these issues.

It is based on a totally new, modular electro-mechanical engineering design that has allowed a fundamental reappraisal of the product to take place in terms of its ergonomics, functionality and aesthetics.

To achieve that, Rediffusion has combined its forty years of flight simulator expertise with the

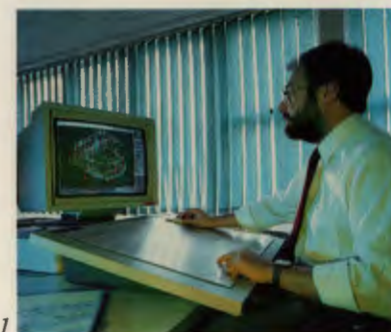
creative design skills of MGA Developments – one of the UK's leading industrial and transportation design houses.

MGA has been responsible for much of the product styling, its material specification and its ergonomic design and its designers have worked closely with Rediffusion engineers at every stage of the programme – from initial concepts to a full production prototype.

Maximum use has been made of computer aided design – especially in design detailing and production engineering. All design concepts have been fully proven, initially through large scale ergonomic models and finally with the completion of a full scale production prototype.

The result, quite simply, raises flight simulator design onto an entirely new plateau – one where function and aesthetics have been delicately balanced to achieve complete design integration in a highly complex device.

In the historical context of the flight simulation industry, Concept 90 is a major innovation. It provides important benefits for our customers and it is an achievement of which we are immensely proud.



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1 Advanced CAD facilities have played a major role in Concept 90 design and engineering.

2 Power supplies are centralised in an easily accessible module.

3 In Concept 90, functional and ergonomic design has been carefully balanced with overall aesthetics.

4 Interior lighting and air conditioning is incorporated into over head panels.

5 & 6 Maintenance access has been designed from first principles.

7 & 8 On board stowage has been designed for equipment and carry on items.



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WELCOME TO THE INSTRUCTOR'S OFFICE

The instructor is fundamental to the operation of a flight simulator as a training device.

Yet, whilst technology has transformed the fidelity of simulation, the functionality of the instructor's environment has not kept pace.

Instructors working in today's flight simulators generally face poor levels of comfort, poor ergonomics and over complex

operating systems.

With Concept 90 we have addressed these issues on two distinct levels.

Starting from first principles we have totally redesigned the instructor's physical operating environment in terms of its comfort, ergonomics and functionality.

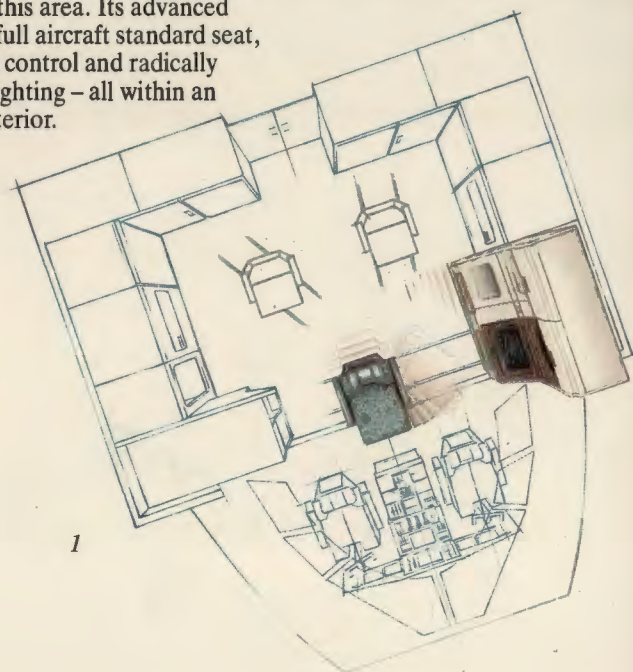
We began from a definition of the optimum training position – one where an instructor can simultaneously view the flying controls, the flight panel, the out-of-the-window scene and, of course, the actions of the pilots.

Almost invariably that is at the rear of the aisle stand – quite high and slightly to the left or right of centre. Unfortunately it is also wholly inconsistent with a touch screen instructor console fixed at either side of the simulator cab.

As a result, all Concept 90 simulators feature a unique moving console to provide a truly effective solution to a complex ergonomic problem. It allows the instructor to position himself ideally for a training exercise and then to position the console for precise fingertip control.

An important aspect of the design is also instructor comfort and for that reason both the seat and console tracking are fully powered, as is the vertical lift on the seat itself.

Comfort, in fact, is a major contributor to instructor efficiency and Concept 90 features major improvements in this area. Its advanced specification includes a full aircraft standard seat, differential temperature control and radically improved stowage and lighting – all within an ambient aircraft style interior.



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At a second level, we looked in detail at the instructional tools and developed ACCESS, an entirely new instructor operating system.

ACCESS is the third generation of touch screen, graphics technology and it is designed specifically for ease of use by pilots and instructors. ACCESS uses high-resolution, colour graphics and membrane touch screens to provide precise control over the training exercise.

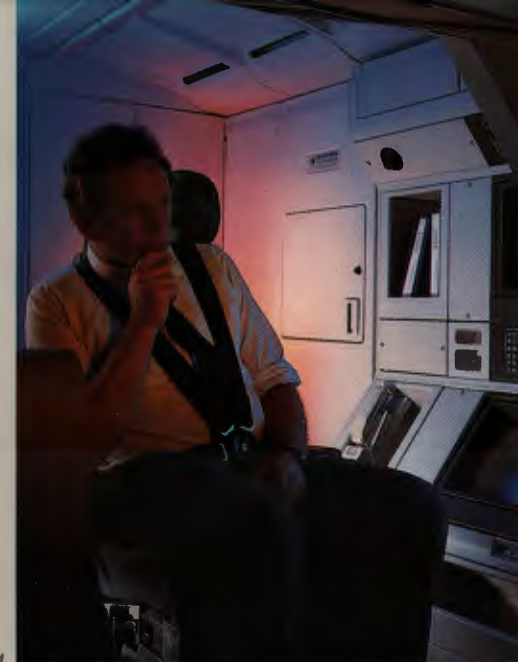
It incorporates three times the computing power of previous generation systems and, because it is close coupled into the simulator host computer, it provides ultra-fast response.

Built into the system is a very extensive lesson capability, which is ideally suited to LOFT type training. Alternatively ACCESS allows an instructor very rapid on-board page build from an extensive library of existing page material.

A powerful authoring system is also incorporated to allow totally new pages to be rapidly created. Significantly, this authoring system has been



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specifically designed for use by non-computer specialists.

In short, ACCESS provides the pilot instructor with immense power and control over the set up and monitoring of a training exercise in a flexible, truly user friendly environment.

As an integral part of Concept 90, it contributes to an instructional package that will favourably transform the work environment of the key person in the flight training equation.

The bottom line, quite simply, is greater training efficiency.

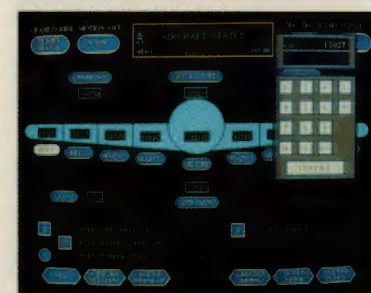
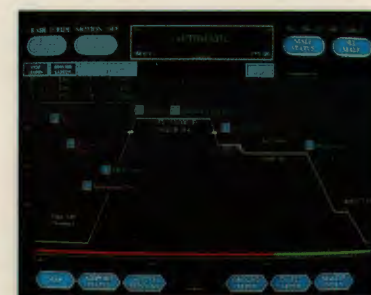
1 & 2 Powered movement of both the instructor seat and console ensure the optimum ergonomic relationship.

3 An on-board colour copier is neatly housed.

4 Concept 90 brings totally new standards of comfort and functionality to the training task.

5 & 6 Totally new console design incorporates high resolution, membrane touch screens.

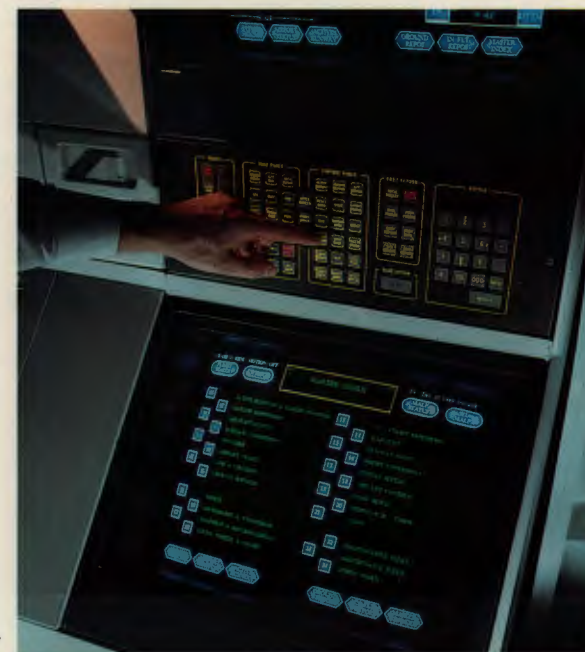
7 ACCESS system provides immense power and control over training exercises.



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A PRODUCTION PHILOSOPHY FOR THE 1990s

Concept 90 is very much more than simply a better product, it is an integrated production philosophy designed to meet the prime needs of the market for the 1990s – improved product quality, faster delivery and lower life cycle costs.

Rediffusion production engineers were involved at every stage of the design and development programme to ensure that the transition, from concept to manufacture, would be smooth and that it would offer zero risk to customer project timescales.

For that reason, the decision was taken very early to build and test a full production prototype simulator.

That process has paid immense dividends in developing and refining the product and its production process, as well as proving the overall integrity of the design concept.

At the heart of Concept 90 production philosophy is maximum modularity and standardisation across all aircraft types and isolation, during the build programme, of aircraft specific items.

This has been achieved through an entirely new motion base structure, which is substantially stronger than its predecessor, but which features a unique interface frame on which the aircraft cab can be built and fitted out, in parallel.

The simulator cab, its electrical systems and ancillary services have, therefore, become virtually standard items which can be very rapidly assembled. A major benefit of this standardisation is that the component parts can be designed to very high specifications and savings made through the economies of scale. In Concept 90 that, together with maximum use of advanced composite and polycarbonate materials and rigorously designed interfaces, ensures much higher standards of product quality.

Rediffusion has also invested heavily in the facilities to put Concept 90 rapidly into volume production.

That investment extends from the application of Computer Aided Design and automated machine

tools, to a total remodelling of the main factory into dedicated build areas and final commissioning sites. This has been achieved in parallel with a major initiative to ensure that overall product quality improves in line with production efficiency.

Whilst all this addresses the hardware side of the product, significant advances have been made in software production, again to improve efficiency and achieve faster integration and final acceptance.

Software development has been progressively moved out of the simulator environment and into powerful independent workstations. At the same time a major investment has been made in a totally new in-house computing centre that allows full software test prior to project involvement.

The result is that software is completed to a much higher standard and comes to a customer programme fully integrated and tested.

The combined benefit is that our customers will be able confidently to expect short acceptance periods and substantially reduced delivery times, as Concept 90 becomes our production standard.

Concept 90 will progressively become Rediffusion's product baseline for all major commercial types and selected military aircraft during 1990.

1 & 5 Software development has been moved into a powerful workstation environment.

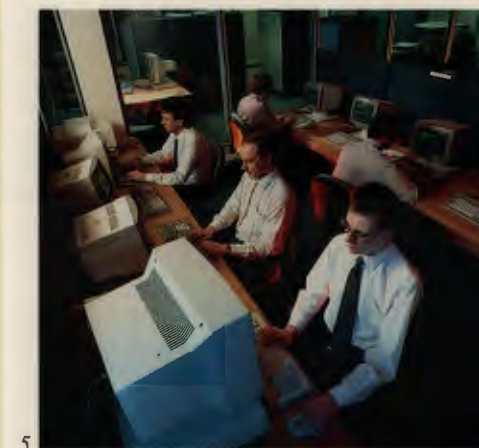
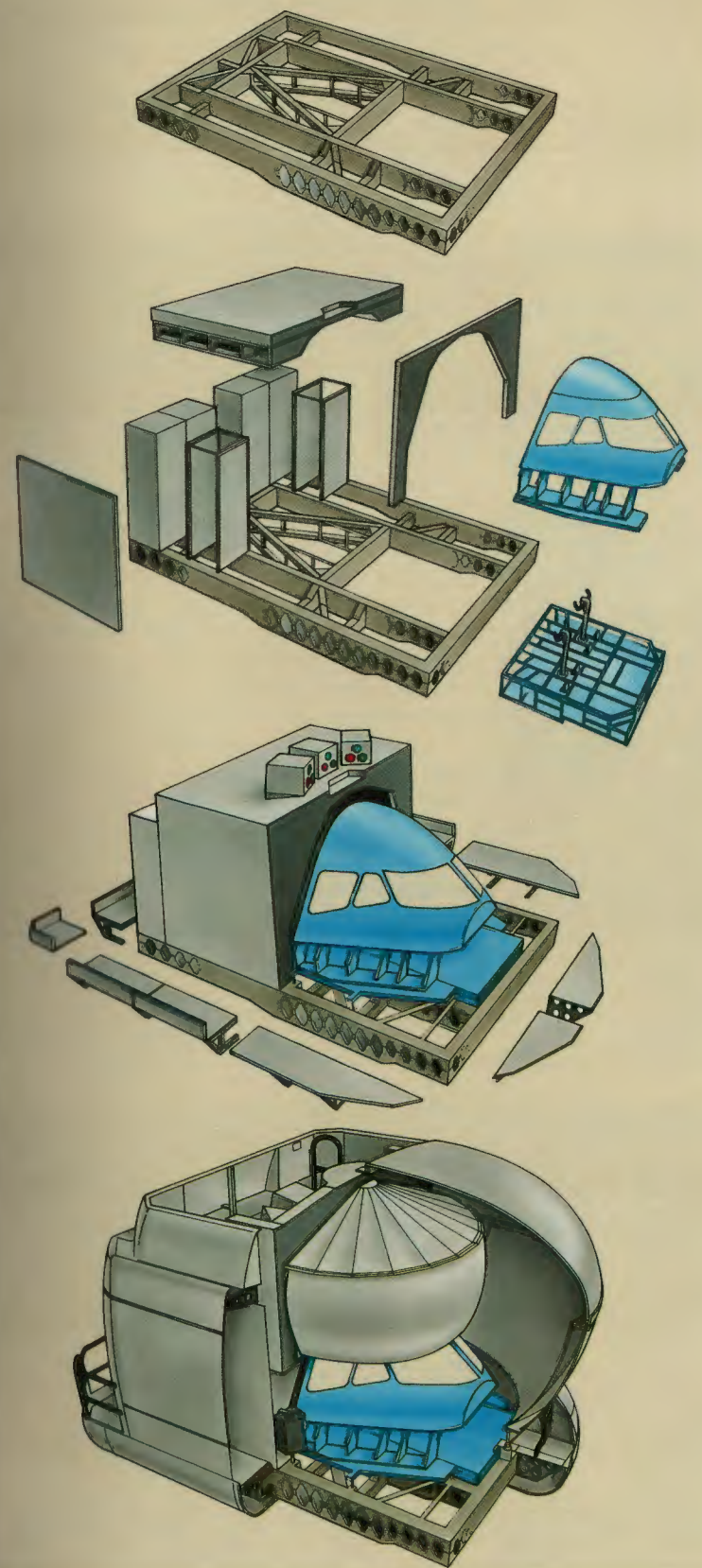
2 & 3 Maximum use has been made of advanced materials to improve quality and durability.

4 Concept 90 is a totally integrated production philosophy which reduces aircraft specific items to a minimum.

6 Major investment has been made in new in-house computing facilities.

7 Manufacturing areas have been remodelled into dedicated build and commissioning sites.

8 New cabling systems improve quality and accessibility.



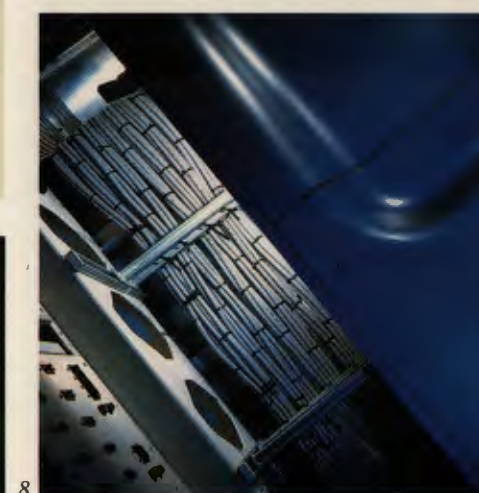
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AN EVOLUTIONARY PLATFORM FOR THE FUTURE

In the mid 1970s Rediffusion launched its New Concept Simulation and, in doing so, asserted its innovative leadership in the airline simulation market.

New Concept Simulators were the first to gain zero flight time training approvals, under the FAA Advance Simulation Plan, and more recently under UK Civil Aviation Authority

regulations.

More than 100 simulators have been built to New Concept standards representing 18 different aircraft types for almost 50 customers worldwide.

In the time since its launch New Concept has hosted major technology change in virtually all the systems of the simulator and that has improved immeasurably the machine's flying fidelity and its reliability of operation.

So much so, that last year the CAA described our Boeing 737 simulator at Aer Lingus as representing the "closest simulation yet to the aircraft".

With Concept 90 we have moved full circle.

Concept 90 now takes over as the evolutionary platform for the 1990s.

It is configured around today's most advanced technology, which has, at its heart, a high speed 32 bit computing complex and which uses state-of-the-art distributed processing and reflective memory techniques.

Unique to Rediffusion is the concept of integrated cue generation, where digital control feel, digital motion and flight dynamics are tightly coupled via the computer's reflective memory system. It is these techniques which enable virtually instantaneous communication between critical software modules and which greatly enhance physical cues to the pilot.

Realism in the overall training environment is further enhanced through a unique Total Sound Environment and Novoview visual simulation system.

Aircraft sounds are digitally formulated and presented to the flight deck using eight individual channels and nineteen loudspeaker units, mounted strategically around the simulator cab, to provide a truly 'wrap around' effect.

Out of the window scenes of real world airports are created using our Novoview SP-X image generating computers and presented to pilots under training via either monitors or the revolutionary SupraWIDE continuous display systems.

The combination of SP-X/SupraWIDE is unquestionably today's most successful and cost effective visual simulation system and it currently dominates the airline market in both the night/dusk and full daylight sectors.

Packaged into Concept 90, this technology is fully proven and currently achieves 99% reliability during 20 hour operating days.

But that's today. Tomorrow undoubtedly will be different.

Rediffusion will evolve Concept 90 as new technologies emerge and mature to provide its customers with the benefits they offer in training efficiency, in increased realism and in maintainability.

It will do so at a pace that ensures all the systems of the simulator reflect the current state-of-the-art, but not so fast that they represent risk to our customers programmes.



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And that's a delicate balance.

It's one that Rediffusion has managed successfully throughout its 40 years history and it's one which, with Concept 90, it will achieve well into the 21st century . . . and beyond.

1 ACCESS instructional system allows rapid lesson page build.

2 & 6 Novoview SP-X visual and WIDE display systems have dominated the market.

3 Novoview SP-X images create a truly realistic training environment on the flight deck of a Boeing 747-400 simulator.

4 Concept 90 will evolve progressively as new technologies mature during the 1990s.

5 Concept 90 simulators are configured around a state-of-the-art computing complex.

7 Advanced motion technology is part of Rediffusion's unique concept of integrated cue generation.



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